

# Protective Coatings by Ion Beam Assisted Deposition

**Project Number: 97-20**

**Investigator: C.C. Smith/EH32**

## Purpose

The purpose of this effort is to develop an in-house expertise of thin film deposition and analysis at MSFC. The work can be used as a knowledge base for durable and performance-enhancing optical films.

## Background

Optics used in adverse environments require protection against chemical and physical attack. The requirements of these protective films are that: 1) they adhere strongly to the substrate; 2) they provide an impervious barrier to the environment; 3) they should not degrade the performance of the optic; and 4) they should resist chemical and physical attack. Thermal evaporation and sputtering techniques deposit thin films with a high degree of porosity, resulting in poor densities. The pores absorb moisture upon exposure to humid conditions, thus limiting the effectiveness of the films' protection against serious attack. Ion beam assisted deposition (IBAD) on the other hand can significantly enhance the durability and performance of the optic.

## Approach

This project will study three aspects of the IBAD process: 1) the fabrication of hard protective coatings with enhanced adhesion and optical properties; 2) the analysis and testing of the adhesion, hardness and optical properties of deposited thin film; and 3) the mechanisms of ion beam assisted growth.

## Accomplishments

All of the items have been procured.

1. Ion source procured and received;
2. Electron beam source procured and received;
3. Vacuum chamber procured;
4. Water chiller procured.

## Planned Future Work

The plan is to have all the items by the middle of January. Experiments should begin by the first of March. Films will be deposited by IBAD and convention electron beam evaporation. Optical, hardness, chemical resistance, abrasive, and adhesive tests will be performed. A comparison of the two deposition techniques will be done.

## Funding Summary (\$k)

Expended: 97k of 98k

## Status of Investigation

Project completed—by FY 2000

A 1-year extension is requested.